Documentation of the
International Stellarator/Heliotron Confinement Database
(ISCDB ver. 27)

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CONTENTS

I. THE INTERNATIONAL STELLARATOR/HELIOTRON CONFINEMENT DATABASE

The ISCDB is a joint database effort conducted within the Coordinated Working Group (CWG) in the IEA Technology Collaboration Programme on Stellarators and Heliotrons. The Technology Collaboration Programme on Stellarators and Heliotrons (SH TCP) is a group of experts that promotes co-operative research on stellarators and heliotron fusion devices.

The objective of the Stellarator-Heliotron TCP is to improve the physics base of the Stellarator-Heliotron concept and to enhance the effectiveness and productivity of research and development efforts related to the Stellarator-Heliotron concept by strengthening the co-operation among IEA member countries.

The Stellarator-Heliotron TCP is organised under the auspices of the International Energy Agency (IEA) but is functionally and legally autonomous. Views, findings and publications of the

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Stellarator-Heliotron TCP do not necessarily represent the views or policies of the IEA Secretariat or its individual member countries.

This update includes data from recent experimental campaigns on Wendelstein 7-X.

magnetic configuration	device configuration	heating	fuelling	edge condition	number of shots
EJM	divertor	X2-ECRH	gas-puff	attached	3
EJM	divertor	O2-ECRH	pellet	detached	3
KKM	divertor	X2-ECRH	gas-puff	attached	3

II. CHANGES TO PREVIOUS VERSIONS

Version 27

The main chage to version 26 is the inclusion of confinement data from Wendelstein 7-X from its initial campaigns with a limiter and a test-divertor unit.

Version 27 consists of a selection of timeslices from W7-X discharges aiming to represent different discharge conditions. The database was compiled from requests for the analysis of specific physics programs. Therfore, the database does not represetn a The column ordering

Version 26

Three groups (806 data) of LHD high-beta survey added (for $\gamma = 1.20$, $\gamma = 1.22$, $\gamma = 1.25$). Together with the already existing two groups of data (for $\gamma = 1.22$ und $\gamma = 1.25$, introduced in Version 22) a total of 1200 LHD high-beta data are availiable. The data are described in [**?**].

The data base contains now 4940 observations. Names of the columns PABSNBI and PABSNBIV21 have been interchanged (correction).

III. DESCRIPTION OF COLUMNS

IMAS

IMAS entries are set in *italic*. The following entries are required to define the IMAS data structure called IDS (independent data structure).
Reference: https://sharepoint.iter.org/departments/POP/CM/IMDesign/Data

1. **ISHCDB:** –
   IMAS: *summary.ids_properties.homogeneous_time*, type: INT_0D
   This node must be filled (with 0, 1, or 2) for the IDS to be valid. If 1, the time of this IDS is homogeneous, i.e. the time values for this IDS are stored in the time node just below the root of this IDS. If 0, the time values are stored in the various time fields at lower levels in the tree. In the case only constant or static nodes are filled within the IDS, *homogeneous_time* must be set to 2 {constant}
   summary.ids_properties.homogeneous_time = 0

2. **ISHCDB:** –
   IMAS: *summary.ids_properties.version_put*, type: structure
   Version of the access layer package used to PUT this IDS

3. **ISHCDB:** –
   IMAS: *summary.ids_properties.version_put.data_dictionary*, type: STR_0D
   Version of Data Dictionary used to PUT this IDS {constant}

4. **ISHCDB:** –
   IMAS: *summary.ids_properties.version_put.access_layer*, type: STR_0D
   Version of the access layer package used to PUT this IDS {constant}

5. **ISHCDB:** –
   IMAS: *summary.ids_properties.version_put.access_layer_language*, type: STR_0D
   Programming language of the Access Layer high level API used to PUT this IDS {constant}

General Parameters

6. **ISHCDB:** DATASOURCE - type: char from list, unit: n/a: sources of data and details on their provision
   (a) ISS95: ISS_DB05 database with 855 entries, 805 entries form the standard data set of the ISS95 database (provider: U. Stroth)[**?**]
   (b) W7AS ECRH AFTER DIVERTOR INSTALLATION: W7AS data, ECRH heating only (29 observations, all enter the ISS04 scaling) (provider: A. Dinklage, A. Kus)
   (c) US_2003: W7-AS data collected by U. Stroht after ISS95 study, for shots 34609 and 40031 NEBAR is missing (167 observations, 86 enter the ISS04 dataset) (provider: U. Stroth)
   (d) W7XOP1.2B: data from the 2018 campaign of Wendelstein 7-X (Dinklage)

   IMAS: *summary.ids_properties.source*, type: STR_0D
   Source of the data (any comment describing the origin of the data : code, path to diagnostic signals, processing method, ...) {constant}:

7. **ISHCDB:** PROVIDER - type: char from list, unit: n/a: name/e-mail of data provider
   IMAS: *summary.ids_properties.provider*, type: STR_0D
   Name of the person in charge of producing this data {constant}

8. **ISHCDB:** COMM - type: char, unit: n/a
   IMAS: *summary.ids_properties.comment*, type: STR_0D
   Any comment describing the content of this IDS {constant}
   not used more but can be used for more detailed description, comment

9. **ISHCDB:** STELL - type: char from list, unit: n/a
   device name
   (a) ATF: Advanced Toroidal Facility (ORNL, USA)
   (b) CHS: Compact Helical System (Nagoya moved to Toki, Japan)
   (c) HELE: Heliotron-E (Kyoto, Japan)
   (d) HELJ: Heliotron-J (Kyoto, Japan)

(e) HSX: Helically Symmetric Experiment (Madison, WI, USA)
(f) LHD: Large Helical Device (Toki, Japan)
(g) TJ-II (Madrid, Spain)
(h) W7-A Wendelstein 7-A (Garching, Germany)
(i) W7-AS Wendelstein 7-AS (Garching, Germany)
(j) W7-X Wendelstein 7-X (Greifswald, Germany)
(k) ITER (Cadarache, France) extrapolation from [**?**]

IMAS: – , type: –

10. **ISHCDB:** STDSET - type: boolean, unit: [0/1]
IMAS: – , type: –
1 if included in the ISS04 dataset (1476 data), 0 otherwise

11. **ISHCDB:** SHEAR_INDICATOR - type: boolean, unit: [0/1]
IMAS: *summary.magnetic_shear_flag.value*, type: STR_0D
Magnetic field shear indicator for stellarators: 0 for shearless stellarators (W7-A, W7-AS, W7-X); 1, otherwise. See [Stroth U. et al 1996 Nucl. Fusion 36 1063]
0 for the Wendelstein line, 1 otherwise (caveat: TJ-II and Heliotron-J have low shear as well)

12. **ISHCDB:** UP_DATE - char: last update (YYYYMMDD)
IMAS: *summary.ids_properties.creation_date*, type: INT_0D
Date at which this data has been produced {constant}

13. **ISHCDB:** SHOT_DATE -char date of shot (YYYYMMDD)
IMAS: –

14. **ISHCDB:** SHOT
(a) for W7-X: type: formatted char, unit: n/a// programme name// format: YYYYMMDD.⟨number⟩
(b) otherwise shot number - integer

IMAS: –

15. **ISHCDB:** SEQ
(a) for W7-X - char: description of sequence the program belongs to - char, e.g. iota-scan, power-scan etc.
(b) otherwise shot number - integer or the first shot number of a sequence

IMAS: –

16. **ISHCDB:** SHOT_TIME - type: double, unit: s
(a) for W7-X: time of trigger t0
(b) otherwise time during the shot when data were taken

IMAS: *summary.time*, type: FLT_1D

17. **ISHCDB:** PHASE - type: char, unit: n/a
classifier for stationarity of the discharge at SHOT_TIME

(a) stat: stationary

(b) non-stat: power, density or reponse quantities

(c) transient: transient, e.g. peak value

IMAS: *summary.stationary_phase_flag.value*, type: INT_0D
needs conversion
This flag is set to one if the pulse is in a stationary phase from the point of the of the energy content (if the time derivative of the energy dW/dt can be neglected when calculating τ_E as $\tau_e = W/(P_{abs} - dW/dt)$.)

Device Geometry

18. **ISHCDB:** RGEO - type: double, unit: m
major radius of the last closed flux surface

(a) ATF: $(R_{max} + R_{min})/2$

(b) HELE:2.17m + radial displacement

(c) W7-AS: 2m + radial displacement

(d) W7-AS high-beta: from VMEC calculations

(e) W7-X: empty

IMAS: –

19. **ISHCDB:** RMAG - type: double, unit: m
major radius of the magnetic axis

(a) HELE:2.2m + radial displacement

(b) W7-AS: 2.05m + radial displacement

(c) W7-AS high-beta: from VMEC calculations

(d) W7-X: from VMEC calculations, toroidally averaged

IMAS: *summary.global_quantities.r0.value*, type: FLT_0D
Reference major radius where the vacuum toroidal magnetic field is given (usually a fixed position such as the middle of the vessel at the equatorial midplane) [m]
summary.global_quantities.r0.source, type: STR_0D
Source of the data (any comment describing the origin of the data : code, path to diagnostic signals, processing method, ...) {constant}

(a) HELE: fixed

(b) W7-AS: fixed

(c) W7-AS high-beta: VMEC calculations

(d) W7-X: VMEC calculations, toroidally averaged

20. **ISHCDB:** AEFF - type: double, unit: m
effective minor radius (volume preserving)

(a) ATF:the iota = 1 radius usually not in contact with the wall

(b) CHS: radius limited by the inner wall

(c) HELE: radius of the last-closed-flux-surface before the ergodic region
(d) LHD: effective radius for 99% of the plasma energy (a_{99}) **to be verified with LHD**
(e) W7-AS: minor radius of last-closed-flux-surface from interpolation formula between available configurations
(f) W7-AS high-beta: from VMEC calculations
(g) W7-X: from VMEC calculations

IMAS: *summary.boundary.minor_radius.value(:)*, type: FLT_1D
Minor radius of the plasma boundary (defined as (Rmax-Rmin) / 2 of the boundary) **. For stellarators from equilibrium calculations** [m]
summary.boundary.minor_radius.source, type: STR_0D

21. **new ISHCDB**: A99 - type: double, unit: m
effective minor radius containing 99% of the plasma energy

(a) LHD: same as AEFF
(b) W7-X: calculated from pressure profieles

IMAS: –

22. **ISHCDB**: VOLUME - type: double, unit: m^{-3}
derived quantity: plasma volume (defined by last-closed-flux-surface or a_{99})

(a) W7-X: $\text{VOLUME} = 2 \times \pi^2 \times \text{ AEFF}^2 \times \text{ RMAG}$
(b) otherwise: $\text{VOLUME} = 2 \times \pi^2 \times \text{ AEFF}^2 \times \text{ RGEO}$

IMAS: *summary.global_quantities.volume.value(:)*, type: FLT_1D
Volume of the confined plasma [m^3]
Value {dynamic} [as_parent]
summary.global_quantities.volume.source, type: STR_0D

23. **ISHCDB**: VOLUME99 - type: double, unit: m^{-3}
derived quantity: plasma volume (defined by last-closed-flux-surface or a_{99})

(a) W7-X: $\text{VOLUME} = 2 \times \pi^2 \times \text{ A99}^2 \times \text{ RMAG}$
(b) otherwise: $\text{VOLUME} = 2 \times \pi^2 \times \text{ A99}^2 \times \text{ RGEO}$

IMAS: –

24. **ISHCDB**: ASEPARATRIX - type: double, unit: m^{-2}
derived quantity: surface area of the last-closed-flux-surface (defined by last-closed-flux-surface or a_{99})

(a) W7-X: $\text{ASEPARATRIX} = 4 \times \pi^2 \times \text{ AEFF}^2 \times \text{ RMAG}$
(b) otherwise: $\text{ASEPARATRIX} = 4 \times \pi^2 \times \text{ AEFF}^2 \times \text{ RGEO}$

IMAS: –

25. **new ISHCDB**: ASEPARATRIX99 - type: double, unit: m^{-2}
derived quantity: surface area of the last-closed-flux-surface (defined by last-closed-flux-surface or a_{99})

(a) W7-X: ASEPARATRIX $= 4 \times \pi^2 \times$ A99$^2 \times$ RMAG

(b) otherwise: ASEPARATRIX $= 4 \times \pi^2 \times$ A99$^2 \times$ RGEO

IMAS: –

26. **ISHCDB**: SEPLIM - type: double, unit: m
minimum distance between the last-closed-flux-surface and the wall/limiter
IMAS: –

Magnetic configuration

27. **ISHCDB**: CONFIG - type: char, unit: n/a
device configuration

(a) W7-X: three-letter configuration ID

(b) otherwise: STD, STD/LIM

IMAS: –

28. **ISHCDB**: BT - type: double, unit: T
toroidal field

(a) W7X: from VMEC

(b) ATF: calcualted from coil current

(c) otherwise: vaccum toroidal field at RGEO

IMAS: *summary.global_quantities.b0.value(:)*, type: FLT_1D
Vacuum toroidal field at R0. Positive sign means anti-clockwise when viewed from above. The product R0B0 must be consistent with the b_tor_vacuum_r field of the tf IDS. [T]. This quantity is COCOS-dependent, with the following transformation :
summary.global_quantities.volume.b0.source, type: STR_0D

29. **ISHCDB**: IP - type: double, unit: A
total plasma current, positive values increase the vacuum iota (equivalent) to direction of tokamak current
IMAS: *summary.global_quantities.ip.value(:)*, type: FLT_1D
Total plasma current (toroidal component). Positive sign means anti-clockwise when viewed from above. [A].
summary.global_quantities.volume.ip.source, type: STR_0D

30. **ISHCDB**: VSURF - type: double, unit: V
loop voltage at plasma boundary, positive values correspond to positive IP
IMAS: *summary.global_quantities.v_loop.value(:)*, type: FLT_1D
LCFS loop voltage (positive value drives positive ohmic current that flows anti-clockwise when viewed from above) [V]. This quantity is COCOS-dependent.
summary.global_quantities.volume.v_loop.source, type: STR_0D

31. **ISHCDB**: IOTAA - type: double, unit: 1
rotational transform at the plasma edge (AEFF)

(a) W7XOP12B: from VMEC

(b) LHD: unknown
(c) WAS: from interpolation formula
(d) otherwise: unknown

IMAS: –

32. **ISHCDB**: IOTA0 - type: double, unit: 1
rotational transform at the plasma centre

(a) W7XOP12B: from VMEC
(b) LHD: unknown
(c) WAS: from interpolation formula
(d) otherwise: unknown

IMAS: –

33. **ISHCDB**: IOTA23 - type: double, unit: 1
rotational transform at the plasma edge at $r_{eff}/AEFF = 2/3$

(a) W7XOP12B: from VMEC
(b) LHD: unknown
(c) W7-AS: from interpolation formula
(d) otherwise: [**?**]

IMAS:*summary.local.r_eff_norm_2_3.iota.value(:)*, type: FLT_1D
Parameters at r_eff_norm = 2/3, where r_eff_norm is the stellarator effective minor radius normalised to its value at the last closed flux surface. Rotational transform (1/q).
summary.local.r_eff_norm_2_3.iota.source, type: STR_0D

34. **ISHCDB**: EPS_EFF23 - type: double, unit: 1
effective helical ripple for $1/\nu$-transport at $r_{eff}/AEFF = 2/3$ (see Ref. [**?**])

(a) W7X: from NTSS code
(b) LHD: provided by M. Yokoyama and S. Murakami (DCOM)
(c) W7-AS: provided by C. Beidler (DKES)
(d) otherwise: unknown

IMAS:*summary.local.r_eff_norm_2_3.effective_helical_ripple.value(:)*, type: FLT_1D
Parameters at r_eff_norm = 2/3, where r_eff_norm is the stellarator effective minor radius normalised to its value at the last closed flux surface. Rotational transform (1/q).
summary.local.r_eff_norm_2_3.effective_helical_ripple.source, type: STR_0D

35. **ISHCDB**: PLATEAU23 - type: double, unit: 1
plateau factor at $1/\nu$-transport at $r_{eff}/AEFF = 2/3$ (see Eq. in Ref. [**?**])

(a) W7X: unknown
(b) LHD: provided by M. Yokoyama and S. Murakami (DCOM)
(c) W7-AS: provided by C. Beidler (DKES)

(d) otherwise: unknown

IMAS:*summary.local.r_eff_norm_2_3.plateau_factor.value(:)*, type: FLT_1D
Parameters at r_eff_norm = 2/3, where r_eff_norm is the stellarator effective minor radius normalised to its value at the last closed flux surface. Rotational transform (1/q).
summary.local.r_eff_norm_2_3.plateau_factor.source, type: STR_0D

36. **ISHCDB**: KAPPA - type: double, unit: 1
elongation

    (a) W7X: t.b.d.
    (b) LHD: $\sqrt{\kappa(\phi = 0) \times \kappa(\phi = \pi/20)}$ avaeraging the local values of the vertically elongated position at $\phi = 0$ and the horizontally lonagated position $\phi = \pi/20$ where ϕ is the toroidal angle and $\kappa = (z_{max} - z_{min})/(R_{max} - R_{min})$ at the last closed flux surface
    (c) otherwise: n/a

    IMAS:*summary.boundary.elongation.value(:)*, type: FLT_1D
    Elongation of the plasma boundary, For stellartors derived from Fourier spectrum of the plasma equlibirium (**definition t.b.d.**)
    summary.lboundary.elongation.source, type: STR_0D

Machine conditions

37. **ISHCDB**: WALMAT - type: char from list, unit: n/a
material of the vacuum vessel wall

    (a) IN: inconel
    (b) INCARB:inconel with carbon
    (c) SS: stainless steel
    (d) SSCARB: stainless steel with carbon
    (e) W7XOP12B: fine grain graphite (divertor 25m^2 ()targets 8MWm^2), heat shield 47m^2, toroidal divertor closure 3m^2, baffles 33m^2) and stainless steel (70m^2) [**?**]

    IMAS:*summary.wall.material.name*, type: STR_0D

    (a) unspecified
    (b) C
    (c) W
    (d) C_W_coating
    (e) SS
    (f) SS_C_coating
    (g) IN
    (h) IN_C_coating
    (i) B_C
    (j) TI_C_coating
    (k) Be

needs expansion for stellarators

38. **ISHCDB**: LIMMAT - type: char from list, unit: n/a
limiter material

    (a) C: carbon
    (b) BORC: boron carbide
    (c) SS: stainless steel
    (d) TIC: titanium-coated graphite

    IMAS: – **why not including LIMMAT and DIVMAT (non existent) into WALMAT and define a list of wall material configurations in WALMAT?**

39. **ISHCDB**: EVAP - type: char from list, unit: n/a
evaporated material

    (a) C: carbonized
    (b) BOR: boronized
    (c) TI: titanium
    (d) CR: chromium
    (e) no evaporation

    IMAS: *summary.wall.evaporation.value*, type: STR_0D
    Chemical formula of the evaporated material or gas used to cover the vaccum vessel wall. NONE for no evaporation.

40. **new: ISHCDB**: DAYS_SINCE_EVAP - type: integer, unit: day
calender days since last evaporation
IMAS: – **suggested to be incorporated**

41. **new: ISHCDB**: SECONDS_SINCE_EVAP - type: integer, unit: day
active discharge seonds since last evaporation
IMAS: – **suggested to be incorporated**

Fuelling

42. **ISHCDB**: PGASA - type: integer, unit: amu
mass number of plasma working gas(es), integer encoding the working gas constituents, use 0 to separate gases, e.g. 1 for hydrogen, 104 for hydrogen/helium

    (a) 0: separator
    (b) 1: hydrogen (protium)
    (c) 2: deuterium
    (d) 3: ^{3}He, tritium
    (e) 4: ^{4}He

    IMAS: **requires processing -** IMAS contains *summary.gas_injection_rates.total* and by elementd and an impurity seeiding indicator

43. **ISHCDB**: PCHARGE - type: integer, unit: elementary charge
charge number of plasma working gas(es), integer encoding the working gas constituents, use 0 to separate gases, e.g. 1 for hydrogen, 102 for hydrogen/helium
   (a) 0: separator
   (b) 1: hydrogen (protium), deuterium, tritium
   (c) 2: ^{3}He, ^{4}He

   IMAS: **requires processing -** IMAS contains *summary.gas_injection_rates.total* and by elementd and an impurity seeiding indicator

44. **new ISHCDB**: PFRACTION - type: integer, unit: 1
fraction of working gases, integer encoding the repective fractions in the plasma composition. FOur digits for each consituent by convention. For single species empty or 1000. For 60%H, 30% D and 10%He: 060003000100. Requires consitency with PGASA and PCHARGE.
IMAS: **requires processing -** IMAS contains *summary.gas_injection_rates.total* and by elementd and an impurity seeiding indicator

45. **new ISHCDB**: PELLET_OPERATION - type: boolean, unit: 1
indicates pellet operation in the discharge
IMAS: *summary.pellets.occurrence.value*, type: STR_0D
Flag set to 1 if there is any pellet injected during the pulse, 0 otherwise [Hz] **is the unit correct?**
IMAS: *summary.pellets.occurrence.source* Source of the data (any comment describing the origin of the data : code, path to diagnostic signals, processing method, ...)

46. **new ISHCDB**: PELLET_MATERIAL - type: integer, unit: amu
mass number of pellet material, integer encoding the working gas constituents, use 0 to separate gases, e.g. 1 for hydrogen, 104 for hydrogen/helium
   (a) 0: separator
   (b) 1: hydrogen (protium)
   (c) 2: deuterium
   (d) 3: tritium
   (e) n: any impurity

   IMAS: – **suggested to be introduced**

47. **new ISHCDB**: PELLET_COMMENT - type: char, unit: n.a.
description of pellet operation.
IMAS: *summary.pellets.occurrence.source* Source of the data (any comment describing the origin of the data : code, path to diagnostic signals, processing method, ...)

Heating

48. **ISHCDB**: ECRH_OPERATION - type: boolean, unit: n/a
indicates ECRH operation **IMAS**: –

49. **ISHCDB**: PECH1 - type: double, unit: W
port-through power for primary ECH

(a) HELE: sum of power from 53GHz gyrotrons
(b) W7-AS: sum of power from 70GHz gyrotrons

IMAS: *summary.heating_current_drive.ec(i1).frequency.value(:)* needs conglomeration with other entries
summary.heating_current_drive.frequency.source

50. **ISHCDB**: PECH2 - type: double, unit: W
port-through power for seondary ECH

(a) W7-AS: sum of power from 140GHz gyrotrons

IMAS: *summary.heating_current_drive.ec(i1).frequency.value(:)* needs conglomeration with other entries
summary.heating_current_drive.frequency.source

51. **ISHCDB**: MECH1 - type: char, unit: n/a
mode of primary ECH **note** previous integer exchanged by O1,X2,O2
IMAS: *summary.heating_current_drive.ec(i1).polarisation.value(:)* INT_1D
Polarisation of the ECRH waves (0 = O mode, 1 = X mode)
IMAS: *summary.heating_current_drive.ec(i1).harmonic.value(:)* INT_1D
Harmonic number of the absorbed ECRH waves

52. **ISHCDB**: MECH2- type: char, unit: n/a
mode of seondary ECH **note** previous integer exchanged by O1,X2,O2
IMAS: *summary.heating_current_drive.ec(i1).polarisation.value(:)* INT_1D
Polarisation of the ECRH waves (0 = O mode, 1 = X mode)
IMAS: *summary.heating_current_drive.ec(i1).harmonic.value(:)* INT_1D
Harmonic number of the absorbed ECRH waves

53. **ISHCDB**: PABSECH - type: double, unit: W
total absorbed ECH

(a) CHS: from radiation level at plasma collapse
(b) HELE: from power switch-off experiments
(c) W7-AS 90 and 100% absorption in first and second harmonics, repectively
(d) LHD: t.b.c.
(e) W7-X: from TRAVIS calculations [**?**]

IMAS: *summary.heating_current_drive.power_ec.value(:)* INT_1D
Electron cyclotron heating power coupled to the plasma from this launcher [W]
IMAS: *summary.heating_current_drive.power_ec.source* STR_0D
Source of the data (any comment describing the origin of the data : code, path to diagnostic signals, processing method, ...)

54. **ISHCDB**: NBI_OPERATION - type: boolean, unit: n/a
indicates NBI operation
IMAS: –

55. **ISHCDB**: BGASA1 - type: integer, unit: amu
mass number of NBI1 working gas(es), integer encoding the working gas constituents, use 0 to separate gases, e.g. 1 for hydrogen, 104 for hydrogen/helium
    (a) 0, empty: none
    (b) 1: hydrogen (protium)
    (c) 2: deuterium
    (d) 4: ^{4}He

    IMAS: *summary.heating_current_drive.nbi(i1).species.a.value* FLT_0D
    Mass of atom [Atomic Mass Unit]
    IMAS: *summary.heating_current_drive.nbi(i1).species.z_n.value* FLT_0D
    Nuclear charge [Elementary Charge Unit]
    IMAS: *summary.heating_current_drive.nbi(i1).species.label.value* STR_0D
    String identifying the species (e.g. H, D, T, ...)

56. **ISHCDB**: BGASA2 - type: integer, unit: amu
mass number of NBI 2 working gas(es) **IMAS**: *summary.heating_current_drive.nbi(i1).species.a.value* FLT_0D
Mass of atom [Atomic Mass Unit]
IMAS: *summary.heating_current_drive.nbi(i1).species.z_n.value* FLT_0D
Nuclear charge [Elementary Charge Unit]
IMAS: *summary.heating_current_drive.nbi(i1).species.label.value* STR_0D
String identifying the species (e.g. H, D, T, ...)

57. **ISHCDB**: BGASA3 - type: integer, unit: amu
mass number of NBI 3 working gas(es) **IMAS**: *summary.heating_current_drive.nbi(i1).species.a.value* FLT_0D
Mass of atom [Atomic Mass Unit]
IMAS: *summary.heating_current_drive.nbi(i1).species.z_n.value* FLT_0D
Nuclear charge [Elementary Charge Unit]
IMAS: *summary.heating_current_drive.nbi(i1).species.label.value* STR_0D
String identifying the species (e.g. H, D, T, ...)

58. **ISHCDB**: BGASA4 - type: integer, unit: amu
mass number of NBI 4 working gas(es) **IMAS**: *summary.heating_current_drive.nbi(i1).species.a.value* FLT_0D
Mass of atom [Atomic Mass Unit]
IMAS: *summary.heating_current_drive.nbi(i1).species.z_n.value* FLT_0D
Nuclear charge [Elementary Charge Unit]
IMAS: *summary.heating_current_drive.nbi(i1).species.label.value* STR_0D
String identifying the species (e.g. H, D, T, ...)

59. **ISHCDB**: BGASA5 - type: integer, unit: amu
mass number of NBI 5 working gas(es) **IMAS**: *summary.heating_current_drive.nbi(i1).species.a.value* FLT_0D
Mass of atom [Atomic Mass Unit]
IMAS: *summary.heating_current_drive.nbi(i1).species.z_n.value* FLT_0D
Nuclear charge [Elementary Charge Unit]

IMAS: *summary.heating_current_drive.nbi(i1).species.label.value* STR_0D
String identifying the species (e.g. H, D, T, ...)

60. **ISHCDB**: ENBI1 - type: double, unit: eV
energy of NBI 1 (power weighted for W7-AS sources 1 & 5)
IMAS: *summary.heating_current_drive.nbi(i1).energy.value(:)* FLT_1D
Full energy of the injected species (acceleration of a single atom)

61. **ISHCDB**: ENBI2 - type: double, unit: eV
energy of NBI 2 (power weighted for W7-AS sources 3 & 2)
IMAS: *summary.heating_current_drive.nbi(i1).energy.value(:)* FLT_1D
Full energy of the injected species (acceleration of a single atom)

62. **new ISHCDB**: ENBI3 - type: double, unit: eV
energy of NBI 3
IMAS: *summary.heating_current_drive.nbi(i1).energy.value(:)* FLT_1D
Full energy of the injected species (acceleration of a single atom)

63. **new ISHCDB**: ENBI4 - type: double, unit: eV
energy of NBI 4
IMAS: *summary.heating_current_drive.nbi(i1).energy.value(:)* FLT_1D
Full energy of the injected species (acceleration of a single atom)

64. **new ISHCDB**: ENBI5 - type: double, unit: eV
energy of NBI 5
IMAS: *summary.heating_current_drive.nbi(i1).energy.value(:)* FLT_1D
Full energy of the injected species (acceleration of a single atom)

65. **ISHCDB**: RTAN1 - type: double, unit: deg
tangency radius for the beam 1
IMAS: *summary.heating_current_drive.nbi(i1).tangency_radius.value* FLT_0D
Tangency radius (major radius where the central line of a NBI unit is tangent to a circle around the torus) [m]

66. **ISHCDB**: RTAN2 - type: double, unit: deg
tangence for the beam 2
IMAS: *summary.heating_current_drive.nbi(i1).tangency_radius.value* FLT_0D
Tangency radius (major radius where the central line of a NBI unit is tangent to a circle around the torus) [m]

67. **new ISHCDB**: RTAN3 - type: double, unit: deg
tangence for the beam 3
IMAS: *summary.heating_current_drive.nbi(i1).tangency_radius.value* FLT_0D
Tangency radius (major radius where the central line of a NBI unit is tangent to a circle around the torus) [m]

68. **new ISHCDB**: RTAN4 - type: double, unit: deg
tangence for the beam 4
IMAS: *summary.heating_current_drive.nbi(i1).tangency_radius.value* FLT_0D
Tangency radius (major radius where the central line of a NBI unit is tangent to a circle around the torus) [m]

69. **new ISHCDB**: RTAN5 - type: double, unit: deg
tangence for the beam 5
IMAS: *summary.heating_current_drive.nbi(i1).tangency_radius.value* FLT_0D
Tangency radius (major radius where the central line of a NBI unit is tangent to a circle around the torus) [m]

70. **ISHCDB**: PNBI1 - type: double, unit: W
port-through power of NBI1
IMAS: *summary.heating_current_drive.nbi(i1).power.value* FLT_1D
NBI power coupled to the plasma by this unit (i.e. without shine-through and fast ion losses) [W]

71. **ISHCDB**: PNBI2 - type: double, unit: W
port-through power of NBI2
IMAS: *summary.heating_current_drive.nbi(i1).power.value* FLT_1D
NBI power coupled to the plasma by this unit (i.e. without shine-through and fast ion losses) [W]

72. **new ISHCDB**: PNBI3 - type: double, unit: W
port-through power of NBI3
IMAS: *summary.heating_current_drive.nbi(i1).power.value* FLT_1D
NBI power coupled to the plasma by this unit (i.e. without shine-through and fast ion losses) [W]

73. **new ISHCDB**: PNBI4 - type: double, unit: W
port-through power of NBI4
IMAS: *summary.heating_current_drive.nbi(i1).power.value* FLT_1D
NBI power coupled to the plasma by this unit (i.e. without shine-through and fast ion losses) [W]

74. **new ISHCDB**: PNBI5 - type: double, unit: W
port-through power of NBI5
IMAS: *summary.heating_current_drive.nbi(i1).power.value* FLT_1D
NBI power coupled to the plasma by this unit (i.e. without shine-through and fast ion losses) [W]

75. **ISHCDB**: GL_HEAT_EFF - type: double, unit: 1
fraction of absorbed power from parametric formula for the global heating efficiency for W7-AS derived by Penningsfeld.It is used to determine PABSNBI for the datasource US2003 and in the calculation of the uncertainty of PTOT for all W7-AS shots
IMAS: needs processing *summary.heating_current_drive.nbi(i1).power.value* FLT_1D
NBI power coupled to the plasma by this unit (i.e. without shine-through and fast ion losses) [W]
IMAS: needs processing *summary.heating_current_drive.nbi(i1).power_launched.value* FLT_1D
NBI power launched into the vacuum vessel from this unit [W]

76. **ISHCDB**: DGL_HEAT_EFF - type: double, unit: 1
derivative of GL_HEAT_EFF with respect to the minor radius
IMAS: –

77. **ISHCDB**: PABSNBI - type: double, unit: W
original Fafner evaluations are available for the following W7-AS shot numbers and used for entry starting with the version 22: 31271, 31387, 31463, 31464, 31465, 31466, 31467, 34187, 34313, 34607, 34608, 34609, 37551. For other cases PABSNBI = PABSNBI_V21
IMAS: *summary.heating_current_drive.power_nbi.value* FLT_1D
Total NBI power coupled to the plasma [W]

78. **ISHCDB**: PABSNBI_V21 - type: double, unit: W
Total absorbed NBI power corrected for shine-through, orbit and charge exchange losses

    (a) CHS, HELE: expression deduced from HELIOS MonteCarlo calculations
    (b) W7-AS: parametric fit deduced from Fafner calculations
    (c) LHD: t.b.d.
    (d) W7-X OP1.2B: BEAMS3D calculations [**?**]

    IMAS: *summary.heating_current_drive.power_nbi.value* FLT_1D
    Total NBI power coupled to the plasma [W]

79. **ISHCDB**: COFRANBI - type: double, unit: 1
ratio of co-injected beam port through power to total NBI power

    (a) HELE: perpendicukar injection (value always 1)
    (b) W7-AS: sources 5, 6, 7, 8 zp all sources
    (c) W7-X: t.b.d.
    (d) LHD: t.b.d.

    IMAS: needs processing *summary.heating_current_drive.power_nbi.value* FLT_1D
    Total NBI power coupled to the plasma [W]
    IMAS: needs processing needs processing *summary.heating_current_drive.power_launched_nbi.value* FLT_1D
    Total NBI power launched from neutral beam injectors into the vacuum vessel [W]

80. **ISHCDB**: ICH_OPERATION - type: boolean, unit: n/a
indicates ICH operation
IMAS: –

81. **ISHCDB**: PICH - type: double, unit: W
port-trough power ICRF
IMAS: *summary.heating_current_drive.power_launched_ic.value(:)* FLT_1D
Total IC power launched from IC antennas into the vacuum vessel [W]

82. **ISHCDB**: FICH - type: double, unit: Hz
ICRF frequency
IMAS: *summary.heating_current_drive.ic(i1).frequency.value(:)* FLT_1D
ICRH frequency [Hz]

83. **ISHCDB**: PABSICH - type: double, unit: W
absorbed ICRF power
IMAS: *summary.heating_current_drive.power_ic.value(:)* FLT_1D
Total IC power coupled to the plasma [W]

84. **ISHCDB**: POH - type: double, unit: W
ohmic heating power
IMAS: *summary.global_quantites.power_ohm.value(:)* FLT_1D
Ohmic power [W]

85. **ISHCDB**: PTOT - type: double, unit: W
total absorbed heating power
derived quantity: PTOT = PABSECH + PABSNBI + PABSICH + POH

86. **new ISHCDB**: PE_FRACTION - type: double, unit: 1
fraction of power going to the electrons

87. **ISHCDB**: PFLUX - type: double, unit: Wm^{-2}
power through the last-closed-flux-surface
derived quantity: PFLUX = PTOT/ASEPARATRIX
IMAS: –

Densities

88. **ISHCDB**: NE_EVOLUTION - type: char from list, unit: n/a
character of density evolution

    (a) STAT: DNEBAR/NEBAR ¡ 5%

    (b) NON STATIONARY: DNEBAR/NEBAR ¿ 5%

    IMAS: –

89. **ISHCDB**: NE0 - type: double, unit: m^{-3}
central electron density

    (a) HELE: from FIR

    (b) otherwise: from Thomson-scattering

    IMAS: *summary.local.magnetic_axis.n_e.value(:)* FLT_1D
    Plasma parameter values at different locations. Parameters at magnetic axis: Electron density [m^{-3}]

90. **ISHCDB**: NEBAR - type: double, unit: m^{-3}
line averaged electron density

    (a) W7-AS: if available from microwave radiometer, from HCN central chord otherwise

    (b) W7-X: data from dispersion interferometer (chord length 1.3m)

    IMAS: *summary.line_average.n_e.value(:)* FLT_1D
    Line average plasma parameters: Electron density [m^{-3}]

91. **ISHCDB**: DNEBAR - type: double, unit: $m^{-3}s^{-1}$ - alias: DNELDT
time derivative of NEBAR

    (a) ATF, HELE, W7-AS: only steady-state

    (b) W7XOP12B: derivative calcaulated over 100 ms

IMAS: *summary.line_average.dn_e_dt.value(:)* FLT_1D
Line average plasma parameters: Time derivative of the electron density [m$^{-3}s^{-1}$]

92. **ISHCDB**: NEVOL - type: double, unit: m^{-3}
volume averaged electron density
    (a) W7-X: from fits to Thomson scattering data $\langle n_e \rangle = \int_V n_e dV/V$
    (b) otherwise: n/a

    IMAS: *summary.volume_average.n_e.value(:)* FLT_1D
    Volume average plasma parameters: Electron density [m^{-}3]

93. **ISHCDB**: PEAKING_NE - type: double, unit: 1
NE0/NEVOL
IMAS: –

94. **ISHCDB**: NE_LCFS - type: double, unit: m^{-3}
electrons at last closed flux surface from equilibrium calculations
IMAS: *summary.local.separatrix.n_e.value(:)* FLT_1D
Plasma parameter values at different locations. Parameters at separatrix: Electron density [m^{-3}]

95. **new ISHCDB**: NE_CONFINED - type: double, unit: 1
electrons in confined volume
IMAS: –

96. **new ISHCDB**: NI0 - type: double, unit: m^{-3}
central ion density **IMAS**: *summary.local.magnetic_axis.n_i_total.value(:)* FLT_1D
Plasma parameter values at different locations. Parameters at magnetic axis: Iondensity [m^{-3}]

97. **new ISHCDB**: NI_LCFS - type: double, unit: 1
working gas ions in confined volume
IMAS: *summary.local.separatrix.n_i_total.value(:)* FLT_1D
Plasma parameter values at different locations. Parameters at separatrix: total ion density [m^{-3}]

98. **new ISHCDB**: NIVOL - type: double, unit: m^{-3}
volume ion averaged density
    (a) W7-X OP1.2B: from fits to Thomson scattering data multiplied by dilution f_d from average Z_{eff} assuming carbon as impurity $\langle n_i \rangle = f_d \times \int_V n_i dV/V$
    (b) otherwise: n/a

    IMAS: *summary.volume_average.n_i_total.value(:)* FLT_1D
    Volume average plasma parameters: Total ion density [m^{-}3]

Temperatures

99. **ISHCDB**: TEVOL - type: double, unit: eV
volume averaged electron temperature
IMAS: *summary.volume_average.t_e.value(:)* FLT_1D
Volume average plasma parameters: Electron temperature [eV]

100. **ISHCDB**: TE0 - type: double, unit: m^{-3}
central electron temperature from Thomson scattering
IMAS: *summary.local.separatrix.t_e.value(:)* FLT_1D
Plasma parameter values at different locations. Parameters at separatrix: Electron temperature [eV]

101. **ISHCDB**: **new** PEAKING_TE - type: double, unit: 1
$T_e^0/\langle T_e \rangle$
IMAS: –

102. **ISHCDB**: TIVOL - type: double, unit: m^{-1}
volume averaged ion temperature **IMAS**: *summary.volume_average.t_i_average.value(:)* FLT_1D
Volume average plasma parameters: Ion temperature [eV]

103. **ISHCDB**: **new** TI0 - type: double, unit: m^{-3}
central ion temperature

    (a) W7-X OP1.2B: from fits to XICS

    IMAS: *summary.volume_average.t_i_average.value(:)* FLT_1D
Plasma parameter values at different locations. Parameters at separatrix: Electron temperature [eV]

104. **ISHCDB**: **new** PEAKING_TI - type: double, unit: 1
$T_i^0/\langle T_i \rangle$
IMAS: –

Impurities

105. **ISHCDB**: ZEFF - type: double, unit: 1
line averaged effective charge
IMAS: *summary.line_average.zeff.value(:)* FLT_1D
Line average plasma parameters: Effective charge [-]

106. **ISHCDB**: PRAD - type: double, unit: W
total radiative power measured with bolomtery
IMAS: *summary.global_quantities.power_radiated.value(:)* FLT_1D
Various global quantities derived from the profiles: Total radiated power [W]

107. **new ISHCDB**: PSOL - type: double, unit: W
total radiated outside the last closed flux surface **IMAS**: *summary.global_quantities.power_radiated_outside_lcfs.valu*
FLT_1D
Various global quantities derived from the profiles: Radiated power from the plasma outside the Last Closed Flux Surface [W]

Pressures

108. **ISHCDB**: PE0 - type: double, unit: Pa
central electron pressure
IMAS: – **appears to be lacking in IMAS - should be discussed and is recommended**

109. **ISHCDB**: PEVOL - type: double, unit: Pa
volume averaged electron pressure
IMAS: –

110. **ISHCDB**: PEAKING_PE - type: double, unit: 1
peaking of the electron pressure
IMAS: –

111. **ISHCDB**: PI0 - type: double, unit: Pa
central ion pressure
IMAS: –

112. **ISHCDB**: PIVOL - type: double, unit: Pa
volume averaged ion pressure
IMAS: –

113. **ISHCDB**: PEAKING_PI - type: double, unit: 1
peaking of the ion pressure
IMAS: –

114. **ISHCDB**: P0 - type: double, unit: Pa
central pressure
IMAS: –

115. **ISHCDB**: PVOL - type: double, unit: Pa
volume averaged pressure
IMAS: –

116. **ISHCDB**: PEAKING_P - type: double, unit: 1
peaking of the n pressure
IMAS: –

Energies

117. **ISHCDB**: WDIA - type: double, unit: J
plasma energy determined from diamagnetic measurements

    (a) HELE: from kinetic profiles and the beam contribution calculated by the PROCTR code

    IMAS: *summary.global_quantities.energy_diamagnetic.value(:)* FLT_1D
    Various global quantities derived from the profiles: Plasma diamagnetic energy content = 3/2 * integral over the plasma volume of the total perpendicular pressure [J] **for stellarators: measurement**

118. **ISHCDB**: DWDIA - type: double, unit: W
time derivative of DWDIA

    (a) PHASE = STAT: 0

    IMAS: *summary.global_quantities.denergy_diamagnetic_dt.value(:)* FLT_1D
    Various global quantities derived from the profiles: Time derivative of the diamagnetic plasma energy content [W]

119. **ISHCDB**: WMHD - type: double, unit: J
plasma energy determined from MHD equilibrium

    (a) ATF: reference values from saddle loop

IMAS: *summary.global_quantities.energy_mhd.value(:)* FLT_1D
Various global quantities derived from the profiles: Plasma energy content = 3/2 * integral over the plasma volume of the total kinetic pressure (pressure determined by an equilibrium reconstruction code) [J]

120. **ISHCDB**: WETH - type: double, unit: J
thermal plasma energy of electrons

    (a) W7-AS: from Thomson scattering
    (b) W7-X OP1.2B: from fits to Thomson scattering data
    (c) LHD: t.b.d.

    IMAS: *summary.global_quantities.energy_electrons_thermal.value(:)* FLT_1D
    Various global quantities derived from the profiles: Thermal electron plasma energy content = 3/2 * integral over the plasma volume of the thermal electron pressure [J]

121. **ISHCDB**: WIONTH - type: double, unit: J
thermal plasma energy of ions

    (a) W7-AS: from simulations with neoclassical transport coefficients
    (b) W7-X OP1.2B: from fits to Thomson scattering data and XICS data
    (c) LHD: t.b.d.

    IMAS: *summary.global_quantities.energy_ion_total_thermal.value(:)* FLT_1D
    Various global quantities derived from the profiles: Thermal electron plasma energy content = 3/2 * integral over the plasma volume of the thermal ion pressure [J]

122. **ISHCDB**: WTH - type: double, unit: J
total thermal plasma energy
derived quantity: WTH = WETH + WIONTH
IMAS: *summary.global_quantities.energy_thermal.value(:)* FLT_1D
Various global quantities derived from the profiles: Thermal plasma energy content = 3/2 * integral over the plasma volume of the thermal ion pressure [J]

123. **ISHCDB**: DWTH - type: double, unit: W
time derivative of WTH

    (a) PHASE = STAT: 0

    IMAS: *summary.global_quantities.denergy_thermal_dt.value(:)* FLT_1D
    Various global quantities derived from the profiles: Time derivative of the thermal plasma energy content [W]

124. **ISHCDB**: WFPER - type: double, unit: J
total energy in perpendiculat fast ions **IMAS**: *summary.global_quantities.energy_fast_perpendicular.value(:)* FLT_1D
Various global quantities derived from the profiles: Fast particles perpendicular energy content = 3/2 * integral over the plasma volume of the fast perpendicular pressure [J]

125. **ISHCDB**: WFPAR - type: double, unit: J
total energy in parallel fast ions **IMAS**: *summary.global_quantities.energy_fast_parallel.value(:)* FLT_1D
Various global quantities derived from the profiles: Fast particles parallel energy content = 3/2 * integral over the plasma volume of the fast perpendicular pressure [J]

Times and performance figures

126. **new ISHCDB**: TAUPULSE - type: double, unit: s
pulse length
IMAS: – **not found in IMAS, recommended to be included**

127. **new ISHCDB**: TAUSTAT - type: double, unit: s
stationary period of discharge phase **IMAS**: – **not found in IMAS, recommended to be included**

128. **ISHCDB**: TAUEDIA - type: double, unit: s
confinement time from diamagnetic measurements
derived quantity: TAUEDIA = WDIA/(PTOT-DWDIA)
IMAS: *summary.global_quantities.tau_energy.value(:)* FLT_1D
Energy confinement time [s]
IMAS: *summary.global_quantities.tau_energy.source* STR_0D
Source of the data (any comment describing the origin of the data : code, path to diagnostic signals, processing method, ...) { constant}

129. TAUETH - type: double, unit: s
confinement time from thermal energy
derived quantity: TAUETH = WDTH/(PTOT-DWDTH) **IMAS**: *summary.global_quantities.tau_energy.value(:)* FLT_1D
Energy confinement time [s]
IMAS: *summary.global_quantities.tau_energy.source* STR_0D
Source of the data (any comment describing the origin of the data : code, path to diagnostic signals, processing method, ...) { constant}
to be used as TAUEDIA but with different source

130. **ISHCDB**: TAULR - type: double, unit: s
L/R time

    (a) W7-X OP1.2B: from NTSS calculations

    IMAS: – **not found in IMAS, recommended to be included**

131. **new ISHCDB**: NEBAR_TI0_TAUE - type: double, unit: m^{-3}keV s
$nT_i^{(0)}\tau_E$
IMAS: – **not found in IMAS, recommended to be included**

132. **new ISHCDB**: NE0_TI0_TAUE - type: double, unit: m^{-3}keV s
$n_e^0 T_i^{(0)}\tau_E$
IMAS: – **not found in IMAS, recommended to be included**

133. **new ISHCDB**: DETACHMENT - type: boolean, unit: n.a.
indicator for detachment
IMAS: – **not found in IMAS, recommended to be included**

134. **new ISHCDB**: RER- type: double, unit: m
cross-over of electron/ion-root transition (from NTSS)
IMAS: – **not found in IMAS, stellarator specific - recommended to be included for a homogenous datasource**

Regression parameters

135. **ISHCDB**: LOG_A - type: double, unit: 1
derived quantity: log_{10}(AEFF)
IMAS: – **not really necessary - can be deleted in forthcoing versions of ISCDB**

136. **ISHCDB**: LOG_R - type: double, unit: 1
derived quantity: log_{10}(RGEO)
IMAS: – **not really necessary - can be deleted in forthcoing versions of ISCDB**

137. **ISHCDB**: LOG_P - type: double, unit: 1
derived quantity: $log_{10}(\text{PTOT}) - 6$
IMAS: – **not really necessary - can be deleted in forthcoing versions of ISCDB**

138. **ISHCDB**: LOG_N - type: double, unit: 1
derived quantity: $log_{10}(\text{NEBAR}) - 19$
IMAS: – **not really necessary - can be deleted in forthcoing versions of ISCDB**

139. **ISHCDB**: LOG_B - type: double, unit: 1
derived quantity: log_{10}(BT)
IMAS: – **not really necessary - can be deleted in forthcoing versions of ISCDB**

140. **ISHCDB**: LOG_I - type: double, unit: 1
derived quantity

    (a) ATF, W7-A, W7-X, W7-AS (exct. high beta): $log_{10}(\text{IOTAA} + (1-2/3)^2(\text{IOTA0} - \text{IOTAA}))$
    (b) CHS: $log_{10}(\text{IOTAA} + (1-2/3)^3(\text{IOTA0} - \text{IOTAA}))$
    (c) HELE, HELJ: $log_{10}(\text{IOTAA} + (1-2/3)^4(\text{IOTA0} - \text{IOTAA}))$
    (d) LHD, TJ-II, HSX, W7-AS high beta, W7-X: log_{10}(IOTA23)

    IMAS: – **not really necessary - can be deleted in forthcoing versions of ISCDB**

141. **ISHCDB**: LOG_TAU - type: double, unit: 1
derived quantity

    (a) HELE, TJ-II: log_{10}(TAUETH)
    (b) otherwise log_{10}(TAUEDIA)

    IMAS: – **not really necessary - can be deleted in forthcoing versions of ISCDB**

142. **ISHCDB**: LOG_TAUE_ISS95 - type: double, unit: 1
ISS95 scaling [**?**]
derived quantity
$\alpha_0 = 0.079$, $\alpha_a = 2.21$, $\alpha_R = 0.65$, $\alpha_P = -0.59$, $\alpha_n = 0.51$, $\alpha_B = 0.83$, $\alpha_\iota = 0.4$ **IMAS**: – **not really necessary - can be deleted in forthcoing versions of ISCDB**

143. **ISHCDB**: LOG_TAUE_ISS04 - type: double, unit: 1
ISS95 scaling [**?**]
derived quantity
$\alpha_0 = 0.134$, $\alpha_a = 2.28$, $\alpha_R = 0.64$, $\alpha_P = -0.61$, $\alpha_n = 0.54$, $\alpha_B = 0.84$, $\alpha_\iota = 0.41$ **IMAS**: – **not really necessary - can be deleted in forthcoing versions of ISCDB**

144. **ISHCDB**: LOG_TAUE_W7 - type: double, unit: 1
ISS95-W7 scaling [**?**]
derived quantity
$\alpha_0 = 0.115$, $\alpha_a = 2.21$, $\alpha_R = 0.74$, $\alpha_P = -0.54$, $\alpha_n = 0.50$, $\alpha_B = 0.73$, $\alpha_\iota = 0.43$ **IMAS**: – **not really necessary - can be deleted in forthcoing versions of ISCDB**

145. **ISHCDB**: LOG_TAUE_LHD - type: double, unit: 1
LHD scaling [**?**]
derived quantity
$\alpha_0 = 0.034$, $\alpha_a = 2.00$, $\alpha_R = 0.75$, $\alpha_P = -0.58$, $\alpha_n = 0.69$, $\alpha_B = 0.84$, $\alpha_\iota = 0.00$ **IMAS**: – **not really necessary - can be deleted in forthcoing versions of ISCDB**

146. **ISHCDB**: LOG_TAUE_LG - type: double, unit: 1
Lackner-Gottardi scaling [**?**]
derived quantity
$\alpha_0 = 0.068 \times 0.0627$, $\alpha_a = 2.00$, $\alpha_R = 1.00$, $\alpha_P = -0.60$, $\alpha_n = 0.60$, $\alpha_B = 0.80$, $\alpha_\iota = 0.40$ **IMAS**: – **not really necessary - can be deleted in forthcoming versions of ISCDB**

147. **ISHCDB**: TAUE_ISS95 - type: double, unit: s
ISS95 scaling [**?**]
IMAS: – **recommended for concept comparison, requires processing for plasma curretn to get IOTA23**

148. **ISHCDB**: TAUE_ISS04 - type: double, unit: s
ISS04 scaling [**?**]
IMAS: – **recommended for concept comparison, requires processing for plasma curretn to get IOTA23**

149. **ISHCDB**: FREN - type: double, unit: 1
TAUE/TAU_ISS04 scaling [**?**]
IMAS: –

150. **ISHCDB**: TAUE_W7 - type: double, unit: s
W7 scaling [**?**]
IMAS: – **recommended for concept comparison, requires processing for plasma curretn to get IOTA23**

151. **ISHCDB**: TAUE_LHD - type: double, unit: s
LHD scaling [**?**]

IMAS: – **recommended for concept comparison, requires processing for plasma curretn to get IOTA23**

152. **ISHCDB**: TAUE_LG - type: double, unit: s
Lackner-Gottardi scaling [**?**]
IMAS: – **recommended for concept comparison, requires processing for plasma curretn to get IOTA23**

Dimensionless regression variables

153. **ISHCDB**: TBAR - type: double, unit: eV
volume avaraged temperature
derived quantity: $\mathsf{WDIA} \times (6 \times \pi^2 \times \mathsf{AEFF}^2 \times \mathsf{RGEO} \times \mathsf{NEBAR} \times 1.602 \times 10^{-19})^{-1}$ **IMAS**: – **not really necessary - can be deleted in forthcoming versions of ISCDB**

154. **ISHCDB**: LDEBYE - type: double, unit: m
mean Debye length
derived quantity: $((8.8542 \times 10^{-12} \times \mathsf{TBAR})/(1.602 \times 10^{-19} \times \mathsf{NEBAR}))^{1/2}$ **IMAS**: – **not really necessary - can be deleted in forthcoming versions of ISCDB**

155. **ISHCDB**: LN_LAMBDA - type: double, unit: 1
mean Coulomb logarithm
derived quantity: $\log(9 \times 4/3 \times \pi \times \mathsf{NBAR} \times \mathsf{LDEBYE}^3)$ **IMAS**: – **not really necessary - can be deleted in forthcoming versions of ISCDB**

156. **ISHCDB**: MFP_ION - type: double, unit: m
ion mean free path
derived quantity: $16 \times \pi \times (8.8542 \times 10^{-12})^2 \times (1.602^{-19} \times \mathsf{PCHARGE})^{-4} \times \ldots$
$(1.602 \times 10^{-19} \times \mathsf{TBAR})^2/(\mathsf{NEBAR} \times \mathsf{LN\_LAMBDA})$ **IMAS**: – **not really necessary - can be deleted in forthcoming versions of ISCDB**

157. **ISHCDB**: RHOSTAR - type: double, unit: 1
ion gyro-radius normlaized by minor plasma radius
derived quantity: $(2 \times 1.602 \times 10^{-19} \times \mathsf{TBAR})/(1.660055 \times 10^{-27} \times \mathsf{PGASA})^{1/2} \times \ldots$
$1.66055 \times 10^{-27} \times \mathsf{PGASA}/(\mathsf{PCHARGE} \times 1.602 \times 10^{-19} \times \mathsf{BT} \times \mathsf{AEFF})$
IMAS: – **recommended to be included into IMAS**

158. **ISHCDB**: BETA - type: double, unit: %
beta values from original data set
IMAS: *summary.global_quantities.beta_tor.value(:)* FLT_1D
Toroidal beta, defined as the volume-averaged total perpendicular pressure divided by ($B0^2/(2*mu0)$), i.e. beta_toroidal = 2 mu0 int(p dV) / V / $B0^2$ [-]

159. **ISHCDB**: BETA0 - type: double, unit: %
beta values calculated
IMAS: – **recommended to be included into IMAS**

160. PEAKING_BETA - type: double, unit:1
peaking of beta
IMAS: – **recommended to be included into IMAS**

161. **ISHCDB**: NUSTAR - type: double, unit: 1
derived quantity:
IMAS: – **recommended to be included into IMAS**

162. **ISHCDB**: NUSTARE0 - type: double, unit: 1
central electron collisionality
IMAS: – **recommended to be included into IMAS**

163. **ISHCDB**: NUSTARI0 - type: double, unit: 1
central ion collisionality
IMAS: – **recommended to be included into IMAS**

164. **ISHCDB**: LOG_RHO - type: double, unit: 1
derived quantity: log_{10}(RHOSTAR)
IMAS: – **not really necessary - can be deleted in forthcoming versions of ISCDB**

165. **ISHCDB**: LOG_NU - type: double, unit: 1
derived quantity: log_{10}(NUSTAR) or log_{10}(NUSTARI0) if available
IMAS: – **not really necessary - can be deleted in forthcoming versions of ISCDB**

166. **ISHCDB**: LOG_BETA - type: double, unit: 1
derived quantity: log_{10}(BETA)
IMAS: – **not really necessary - can be deleted in forthcoming versions of ISCDB**

167. **ISHCDB**: PHI_PARA - type: double, unit: s^{-1}
LHD parallel flux
IMAS: – **LHD specific - could go to tags**

168. **ISHCDB**: PHI_HEL - type: double, unit: s^{-1}
LHD helical flux
IMAS: – **LHD specific - could go to tags**

169. **ISHCDB**: PHI_TOR - type: double, unit: s^{-1}
LHD toroidal flux
IMAS: – **LHD specific - could go to tags**

Uncertainties

170. **ISHCDB**: SIGMA_AEFF - type: double, unit: m
uncertainty of the effective minor radius
IMAS: requires specification/discussion

171. **ISHCDB**: SIGMA_PTOT - type: double, unit: W
uncertainty of the absorbed power
IMAS: requires specification/discussion

172. **ISHCDB**: SIGMA_NEBAR - type: double, unit: m^{-3}
uncertainty of the line averaged density
IMAS: requires specification/discussion

173. **ISHCDB**: SIGMA_W - type: double, unit: J
uncertainty of the plasma energy
IMAS: requires specification/discussion

174. **ISHCDB**: SIGMA_LOGA - type: double, unit: 1
uncertainty of LOGA
IMAS: requires specification/discussion

175. **ISHCDB**: SIGMA_LOGP - type: double, unit: 1
uncertainty of LOGP
IMAS: requires specification/discussion

    (a) W7XOP12B: derivative calcaulated over 100 ms

176. **ISHCDB**: SIGMA_NEBAR - type: double, unit: $m^{-3}s^{-1}$ -
error of NEBAR

177. **ISHCDB**: SIGMA_LOGN - type: double, unit: 1
uncertainty of LOGN
IMAS: requires specification/discussion

178. **ISHCDB**: SIGMA_LOGT - type: double, unit: 1
uncertainty of LOGT
IMAS: requires specification/discussion

IV. ISCDB VER. 27 IN IMAS

The assignement of ISCDB items to IMAS was conducted on wiht the indpendent data structure (IDS) *ITER Physics Data Model Documentation for summary* (https://sharepoint.iter.org/departments/POP/CM/IMDe
3.33.0/summary.html)

V. REFERENCES

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